

## **SECTION 04800**

### **MASONRY**

#### **PART 1 - GENERAL**

##### **0.1 DESCRIPTION OF WORK**

**A.** Work Included: This Section specifies the following items.

1. Concrete masonry units.
2. Face brick.
3. Stone trim units.
4. Mortar and grout.
5. Reinforcing steel, masonry joint reinforcement, ties and anchors
6. Masonry-cell insulation.
7. Cavity-wall insulation.

**B.** Items To Be Installed Only: Install the following items as furnished by the designated Sections:

1. Section 04400 - STONE:
  - a. Inserts for stone anchors.
2. Section 05500 - MISCELLANEOUS METALS:
  - a. Lintels, miscellaneous metal and iron sleeves, anchors, inserts and plates to be built into masonry walls.
3. Section 06100, ROUGH CARPENTRY:
  - a. Wood nailers and blocking built into masonry.
4. Section 07600, FLASHING AND SHEET METAL:
  - a. Through-wall flashings and built-in flashings.
5. Section 10430, SIGNS:
  - a. Anchors and inserts for monumental signage.
6. Section 14200, ELEVATORS:
  - a. Elevator rail bracket inserts.
7. Section 15400, PLUMBING:
  - a. Access doors in masonry openings.

8. Section 15600, HEATING, VENTILATING, AND AIR CONDITIONING:
  - a. Grilles in interior masonry walls.
  - b. Access doors in masonry openings.
  - c. Pipe and duct sleeves for placement into masonry openings.
9. Division 16 - ELECTRICAL:
  - a. Access doors in masonry openings.
- C. Items To Be Furnished Only:** Furnish the following items for installation by the designated Sections:
  1. Section 03300 - CAST-IN-PLACE CONCRETE:
    - a. Dovetail slots for masonry anchors.
  2. Section 05100 - STRUCTURAL STEEL:
    - a. Anchor sections of adjustable masonry anchors for connecting to structural frame.
- D. Related Work:** The following items are not included in this Section and will be performed under the designated Sections:
  1. Section 07920 - JOINT SEALANTS; sealing control and expansion joints in unit masonry.

## **0.2 SUBMITTALS**

- A. Product Data:** For each type of product indicated.
- B. Shop Drawings:** For the following:
  1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
  2. Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.
  3. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
- C. Samples for Verification:** For each type and color of the following:
  1. Exposed concrete masonry units.
  2. Face brick, in the form of straps of five or more bricks.
  3. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
  4. Stone trim.

5. Weep holes/vents.
6. Accessories embedded in masonry.

**D.** Qualification Data: For testing agency.

**E.** Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:

1. Masonry units.
  - a. Include material test reports substantiating compliance with requirements.
  - b. For bricks, include size-variation data verifying that actual range of sizes falls within specified tolerances.
  - c. For exposed brick, include material test report for efflorescence according to ASTM C 67.
  - d. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
6. Joint reinforcement.
7. Anchors, ties, and metal accessories.

**F.** Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports, per ASTM C 780 for mortar mixes required to comply with property specification.
2. Include test reports, per ASTM C 1019 for grout mixes required to comply with compressive strength requirement.

**G.** Tests Results: For each type of test including mortar, grout and prism tests, for approval by the Engineer.

**H.** Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

**I.** UL Certificate of Compliance for fire rated concrete masonry units.

### **0.3 QUALITY ASSURANCE**

- A.** Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.
- B.** Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
- C.** Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.
- D.** Preconstruction Testing Service: The Contractor will engage a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by the Contractor. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.
  - 1. Prism Test: For each type of construction required, per ASTM C 1314; strength as specified.
- E.** Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction. All fire rated Concrete Masonry Units shall meet the requirements of UL-618, Standards of Concrete Masonry Units. Concrete Masonry Units to be used for the construction of 2-Hour, 3-Hour and 4-Hour Fire Rated Walls shall be clearly marked by manufacturer. The manufacturer shall clearly mark all concrete masonry units in each cube with the appropriated UL designation of 2-Hour, 3-Hour or 4-Hour.
- F.** Hold Point - Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Division 1 for mockups.
  - 1. Build sample panels for typical exterior and interior walls in sizes approximately 48 inches long by 48 inches high by full thickness.
  - 2. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.
  - 3. Clean one-half of exposed faces of panels with masonry cleaner indicated.
  - 4. Protect approved sample panels from the elements with weather-resistant membrane.
  - 5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and

other material and construction qualities specifically approved by Engineer in writing.

- a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Engineer in writing.
- b. The standard for the work during construction shall be the same as demonstrated on approved panels.

#### **0.4 DELIVERY, STORAGE, AND HANDLING**

- A.** Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B.** Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C.** Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D.** Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- E.** Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

#### **0.5 PROJECT CONDITIONS**

- A.** Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
  - 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
  - 2. Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B.** Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

- C. Stain Prevention:** Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
  2. Protect sills, ledges, and projections from mortar droppings.
  3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements:** Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
1. **Cold-Weather Cleaning:** Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements:** Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

## **PART 2 - PRODUCTS**

### **0.1 CONCRETE MASONRY UNITS (CMUs)**

- A. Concrete Masonry Units:** ASTM C 90, normalweight unless indicated otherwise manufactured to dimensions 3/8 inch less than nominal dimensions.
- B. Shapes:** Provide standard shapes indicated and as required for building configuration. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
- C. Integral Water Repellent:** Provide units made with integral water repellent for exposed units.
1. **Integral Water Repellent:** Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive according to ASTM E 514, with test period extended to 24 hours, show no visible water or leaks on the back of test specimen. Available products include:
    - a. Addiment Incorporated; Block Plus W-10.

- b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block.
- c. Master Builders, Inc.; Rheopel.

## **0.2 BRICK**

### **A. Face Brick: ASTM C 216, Grade SW, Type FBS.**

- 1. Trade Reference and Color: As selected by Engineer.
- 2. Size (Actual Dimensions): As selected by Engineer.
- 3. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.
- 4. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced".
- 5. Where shown to "match existing", provide face brick matching color range, texture, and size of existing adjacent brickwork.

### **B. Building (Common) Brick where Concealed: ASTM C 62, Grade SW.**

### **C. General: Provide shapes indicated and as follows:**

- 1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
- 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
- 3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces.
- 4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- 5. Units which are sawn and less than one-half full size shall not be used.

## **0.3 STONE TRIM UNITS**

### **A. Granite: Provide granite complying with ASTM C 615 and NBGQA's "Specifications for Architectural Granite" and as follows:**

- 1. Varieties, Cut and Finish: As selected by Engineer.

### **B. Limestone: Provide limestone complying with ASTM C 568 and ILI's "Indiana Limestone Handbook" and as follows:**

- 1. Varieties, Cut and Finish: As selected by Engineer.

### **C. Provide stone units accurately shaped, with exposed faces dressed true, and with beds and joints at right angles to faces.**

1. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite".
2. For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook".

#### **0.4 MORTAR AND GROUT MATERIALS**

- A.** Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B.** Hydrated Lime: ASTM C 207, Type S.
- C.** Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
  1. Available Products:
    - a. Bayer Corporation, Industrial Chemicals Div.; Bayferrox Iron Oxide Pigments.
    - b. Davis Colors; True Tone Mortar Colors.
    - c. Solomon Grind-Chem Services, Inc.; SGS Mortar Colors.
- D.** Aggregate for Mortar: ASTM C 144. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
- E.** Aggregate for Grout: ASTM C 404.
- F.** Water: Potable.

#### **0.5 REINFORCEMENT**

- A.** Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
- B.** Masonry Joint Reinforcement, General: ASTM A 951.
  1. Interior Walls: Mill-galvanized, carbon steel.
  2. Exterior Walls: Hot-dip galvanized, carbon steel.
  3. Wire Size and Spacing: As required by Code.
  4. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- C.** Masonry Joint Reinforcement for Multiwythe Masonry:
  1. Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches in width, plus 1 side rod at each wythe of masonry 4 inches or less in width.



## **0.6 TIES AND ANCHORS**

- A. Materials:** Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with subparagraphs below, unless otherwise indicated.
1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 641/A 641M, Class 1 coating.
  2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
  3. Stainless-Steel Wire: ASTM A 580/A 580M, Type 316.
  4. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
  5. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
  6. Stainless Steel bars: ASTM A 276 or ASTM A 666, Type 304.
- B. Adjustable Anchors for Connecting to Structure:** Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-diameter, hot-dip galvanized steel. Mill-galvanized wire may be used at interior walls, unless otherwise indicated.
- C. Partition Top Anchors:** 0.097-inch-thick metal plate with 3/8-inch-diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- D. Stone Anchors:** Fabricate dowels, cramps, and other stone anchors from stainless steel.
- E. Adjustable Masonry-Veneer Anchors:**
1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, with structural performance capable of withstanding a 100-lb of load in both tension and compression without deforming or developing play in excess of 0.05 inch. Flat metal anchors are not acceptable.
  2. Contractor's Option: Unless otherwise indicated, provide any of the following types of anchors.
  3. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section.
    - a. Anchor Section: Zinc-alloy barrel section with flanged head with eye and corrosion-resistant, self-drilling screw. Eye designed to receive wire tie and to serve as head for drilling fastener into framing. Barrel length to suit sheathing thickness, allowing screw to seat directly against framing with flanged head covering hole in sheathing.

- b. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.188-inch-diameter, hot-dip galvanized steel wire.

## **0.7 MISCELLANEOUS ANCHORS**

- A. Anchor Bolts: L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

## **0.8 EMBEDDED FLASHING MATERIALS**

- A. Metal Flashings: Furnished under Section 07620.

## **0.9 MISCELLANEOUS MASONRY ACCESSORIES**

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Weep/Vent Products: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch less than depth of outer wythe; in color selected from manufacturer's standard.
- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity. Provide strips, full-depth of cavity and 10 inches wide, with dovetail shaped notches 7 inches deep that prevent mesh from being clogged with mortar droppings or equivalent. Available products:
  - 1. Advanced Building Products Inc.; Mortar Break II.
  - 2. Archovations, Inc.; CavClear Masonry Mat.
  - 3. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
  - 4. Mortar Net USA, Ltd.; Mortar Net.

## **0.10 MASONRY CLEANERS**

- A.** Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
1. Available Manufacturers:
    - a. Diedrich Technologies, Inc.
    - b. EaCo Chem, Inc.
    - c. ProSoCo, Inc.

## **0.11 MORTAR AND GROUT MIXES**

- A.** General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
1. Do not use calcium chloride in mortar or grout.
  2. Limit cementitious materials in mortar to Portland cement [mortar cement] and lime.
- B.** Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
1. For masonry below grade or in contact with earth, use Type M, minimum strength 2,500 psi.
  2. For reinforced masonry, use Type S, minimum strength 1,800 psi.
  3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N, minimum strength 75 psi.
- C.** Pigmented Mortar: Use colored cement product. Pigments shall not exceed 10 percent of Portland cement by weight.
- D.** Grout for Unit Masonry: Comply with ASTM C 476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
  2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

## **PART 3 - EXECUTION**

### **0.1 EXAMINATION**

- A.** Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
  - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
  - 2. Verify that foundations are within tolerances specified.
- B.** Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C.** Proceed with installation only after unsatisfactory conditions have been corrected.

### **0.2 INSTALLATION, GENERAL**

- A.** Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B.** Build chases and recesses to accommodate items specified in this and other Sections.
- C.** Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- D.** Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed. Do not use units cut to less than one-half size.
- E.** Do not install concrete masonry units with more than 5 percent damage to the face. Do not install brick units which will show defects after installation.
- F.** Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- G.** Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

**H.** Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

**I.** Do not retemper mortar.

### **0.3 LAYING MASONRY WALLS**

- A.** Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B.** Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in bond pattern indicated on Drawings; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs. Prior to installation review bond pattern with Engineer.
- C.** Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D.** Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E.** Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.

- F.** Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- G.** Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
  - 1. Install compressible filler in joint between top of partition and underside of structure above.
  - 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c., unless otherwise indicated.
  - 3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
  - 4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 7 Section "Firestopping".

#### **0.4 MORTAR BEDDING AND JOINTING**

- A.** Lay hollow brick and concrete masonry units as follows:
  - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
  - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
  - 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
  - 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B.** Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C.** Set stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
  - 1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
  - 2. Allow cleaned surfaces to dry before setting.
- D.** Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
- E.** Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

## **0.5 CAVITY WALLS**

- A.** Bond wythes of cavity walls together using one of the following methods:
  - 1. Masonry Joint Reinforcement: Installed in horizontal mortar joints. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.
  - 2. Masonry Veneer Anchors: Comply with requirements for anchoring masonry veneers.
- B.** Bond wythes of cavity walls together using bonding system indicated on Drawings.
- C.** Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.
- D.** Coordinate and allow access for air and vapor barrier membrane and insulation installed in cavity under Section 07190 - Air and Vapor Barrier System.

## **0.6 MASONRY JOINT REINFORCEMENT**

- A.** General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches. Space reinforcement not more than 16 inches o.c.
- B.** Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C.** Provide continuity at wall intersections by using prefabricated T-shaped units.
- D.** Provide continuity at corners by using prefabricated L-shaped units.

## **0.7 ANCHORING MASONRY TO STRUCTURAL MEMBERS**

- A.** Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
  - 1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.
  - 2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.

3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

## **0.8 ANCHORING MASONRY VENEERS**

- A.** Anchor masonry veneers with masonry-veneer anchors to comply with the following requirements:
  1. Fasten screw-attached anchors through insulation and sheathing to wall framing and to concrete and masonry backup as applicable with metal fasteners of type indicated.
  2. Embed tie sections in masonry joints. Provide air space indicated on the Drawings between back of masonry veneer and face of insulation.
  3. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
  4. Space anchors as required by Code.

## **0.9 CONTROL AND EXPANSION JOINTS**

- A.** General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B.** Form control joints in concrete masonry using one of the following methods:
  1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
  2. Install preformed control-joint gaskets designed to fit standard sash block.
  3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
  4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.
- C.** Form expansion joints in brick made from clay or shale as follows:
  1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
  2. Build flanges of factory-fabricated, expansion-joint units into masonry.
  3. Build in compressible joint fillers where indicated.
  4. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 7 Section "Joint Sealants".



- D.** Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section "Joint Sealants", but not less than 3/8 inch.

- 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

## **0.10 LINTELS**

- A.** Install steel lintels where indicated.
- B.** Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

## **0.11 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS**

- A.** General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B.** Install flashing as follows, unless otherwise indicated:
  - 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
  - 2. At multiwythe masonry walls, including cavity walls, extend flashing through outer Wythe, turned up a minimum of 8 inches, and 1-1/2 inches into the inner wythe. Form 1/4-inch hook in edge of flashing embedded in inner wythe.
  - 3. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 8 inches; with upper edge covered with elastomeric membrane, lapping at least 4 inches.
  - 4. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
- C.** Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- D.** Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
  - 1. Use open head joints to form weep holes.
  - 2. Space weep holes 24 inches o.c., unless otherwise indicated.

- E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 "Miscellaneous Masonry Accessories" Article.
- F. Install vents in head joints in exterior wythes at spacing indicated.

## **0.12 REINFORCED UNIT MASONRY INSTALLATION**

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
  - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
  - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

## **0.13 FIELD QUALITY CONTROL**

- A. Inspectors: The Contractor shall engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections. Place grout only after inspectors have verified compliance of grout spaces and grades, sizes, and locations of reinforcement.
- B. Testing Agency: The Contractor shall engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.
- C. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof. Test types as determined by the independent testing and inspection agency.

#### **0.14 REPAIRING, POINTING, AND CLEANING**

- A.** Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B.** Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C.** In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D.** Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Engineer's approval of sample cleaning before proceeding with cleaning of masonry.
  - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
  - 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
  - 6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
  - 7. Clean stone trim to comply with stone supplier's written instructions.

#### **0.15 MASONRY WASTE DISPOSAL**

- A.** Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B.** Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
  - 1. Crush masonry waste to less than 4 inches in each dimension.
  - 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 2 Section "Earthwork".
  - 3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off the Site.

#### **PART 4 - MEASUREMENT AND PAYMENT**

##### **0.1 MEASUREMENT**

- A. The items below will be measured per square foot complete in place, including all accessories and incidentals.
- B. No separate measurement or payment will be made for reinforcement, mortar, grout, anchors, ties, and all other miscellaneous accessory work required under this Section. All costs in connection therewith will be considered incidental to the item or items of work to which they pertain.

##### **0.2 PAYMENT**

- A. Payment for the items below will be made at the Contract unit price for the measurement as specified above.

##### **0.3 PAYMENT ITEMS**

<b>ITEM NO.</b>	<b>DESCRIPTION</b>	<b>UNIT</b>
0421.040	BRICKWORK	SF
0422.080	4" CONCRETE BLOCK	SF
0422.090	6" CONCRETE BLOCK	SF
0422.100	8" CONCRETE BLOCK	SF
0422.110	12" CONCRETE BLOCK	SF

**END OF SECTION**

## **NOTES TO THE DESIGNER**

- A.** Any request to modify or waive the specification requirements listed below must be approved in writing by the MBTA's Director of Design:
1. Minimum mortar strengths as specified in ASTM C270 shall not be reduced.